

PATENT
Attorney Docket No. 401440

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

KOSAKI et al.

Application No. Unassigned
Filed: November 8, 2001
For: METHOD FOR
MANUFACTURING
SEMICONDUCTOR
DEVICE AND SEMI-
CONDUCTOR

Art Unit: Unassigned
Examiner: Unassigned

PENDING CLAIMS AFTER ENTRY OF PRELIMINARY AMENDMENT

6. A semiconductor device comprising:

a semiconductor substrate having first and second main surfaces, having a semiconductor element in the first main surface, and having a peripheral surface contacting the first and second main surfaces;

a heat radiation layer on the second main surface of the semiconductor substrate;
and

a flange including a plurality of metal layers disposed on the peripheral surface of the substrate, the metal layers comprising:

a first metal layer having a surface layer containing palladium on a side toward the first main surface;

a second metal layer of a nickel-based alloy disposed on the surface layer containing palladium of the first metal layer, the second metal layer having a top portion located below the first main surface; and

a third metal layer disposed under the first metal layer.

7. The semiconductor device according to claim 6, wherein the third metal layer comprises a nickel-based alloy layer, a gold layer, and a laser-cut metal layer including one of a nickel layer and a chromium layer.

8. The semiconductor device according to claim 7, wherein the third metal layer is selected from the group consisting of a single layer of gold, and a plurality of layers including a titanium layer and a gold layer, on the laser-cut metal layer.
9. The semiconductor device according to claim 6, wherein the first metal layer comprises one selected from the group consisting of a palladium layer and a titanium layer under the palladium layer, and a single layer.
10. The semiconductor device according to claim 6, wherein the second metal layer is selected from the group consisting of Ni-P alloy, Ni-B alloy, and Ni-B-W alloy.